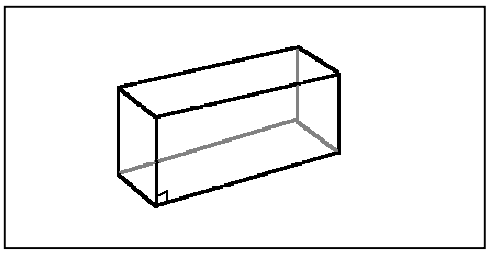
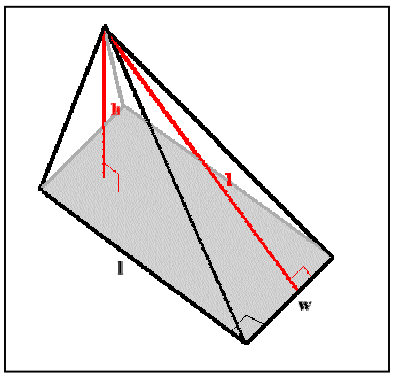
Activity #3: Volume Investigation (Teacher version)
Math

Right Prism



Right Pyramid



***Note to students*: Lab teams of two or three students are required for this activity.**

National Standards addressed:

Content Standards:
Algebra Standard Expectation: Students will draw reasonable conclusions about a situation being modeled.
Geometry Standard Expectations: Students will analyze properties and determine attributes of two- and three- dimensional objects; students will draw and construct representations of two- and three- dimensional geometric objects using a variety of tools.
Measurement Standard Expectations: Students will make decisions about units and scales that are appropriate for problem situations involving measurement; students will analyze precision, accuracy, and approximate error in measurement situations; students will understand and use formulas for the are, surface area, and volume of geometric figures.

Process Standards:
Communication Standard Expectations: Students will organize and consolidate their mathematical thinking through communication; students will communicate their mathematical thinking coherently and clearly to peers, teachers, and others.
Connection Standard Expectation: Students will understand how mathematical ideas interconnect and build on one another to produce a coherent whole.

***Purpose*: To construct a right prism and a right pyramid of same base and height**
To understand better the Pythagorean Theorem
To rediscover the relationship between exact and approximate answers
To investigate the volume formulas for prism and pyramid
To utilize constructions and known geometric properties

***Materials*: folder-weight paper, metric ruler, compass, protractor, scotch tape, stapler, calculator such as the TI-83, small objects of the same size to fill each solid**

***Activity Explanation*: In this activity, teams of two students will construct models of one right prism and one right pyramid. These two solids must have congruent bases and congruent heights. Students will test the formulas for volume, that is, $V_{prism} = Bh$ and $V_{pyramid} = \frac{1}{3}Bh$. Students must construct each solid so that it can be filled, so as to approximate its volume. Thus, the base of each solid must be removable. (Up to this point, students have worked with formulas and found volumes of all sorts of figures, both plane and solid.)**

***Activity Procedure*:**
1. Design the nets for the prism and pyramid. Label each side and heights/altitudes, using mm. Show all work. Pass in the nets for teacher check. (Check these nets, perhaps as a homework or classwork assignment, before students move on to the next step.)

2. Cut out each net and fold each to form the solids. Remember the solids need to be filled to confirm the volume formulas. Pass in the solids for teacher check. (Remind students about "filling" as they begin to tape and staple their models. Check models now.)

3. Test the validity of the volume formulas by filling each solid. Using each unit of fill as the volume unit, record the number of units needed to fill each solid. What volume unit did you use? _____
What is the volume of the prism?_____
What is the volume of the pyramid?_____
Be sure to label you answers in correct units.

Analysis and Extension:

1. Describe the activity, giving special note to the easy and harder spots in the activity. Discuss the math you used in the activity. Do you think you will remember these formulas easier now? Will this activity help you remember any other volume formulas?

2. Calculate the surface area of each model. Show all work.

Surface area of prism = _____

Surface area of pyramid = _____

Are these related the same way as the volumes? _____

_____

_____

_____

_____

(Remind students about surface area formulas and the requirements of base and height.)

The following web sites and articles provide enrichment and support for this activity:

1. http://www.aaamath.com/geo.html

2. http://library.thinkquest.org/20991/geo/index.html

3. http://www.math.com/tables/geometry/volumes.htm

4. http://www.mathleague.com/help/geometry/3space.htm#volume

5. http://mathworld.wolfram.com/Prism.html

6. http://standards.nctm.org/document/eexamples/chap6/6.3/part2.htm

An activity for Grades 3 – 5 can be found at http://illuminations.nctm.org/imath/3-5/GeometricSolids/student/GeoSolids4.html**.**

An activity for Grades 6 – 8 can be found at http://illuminations.nctm.org/imath/6-8/isometric/cube68m1.htm**.**